The Great Basin Naturalist

Published at Provo, Utah, by
Brigham Young University

Volume 31 | September 30, 1971 | No. 3

NOTES ON WHITE-TAILED PRAIRIE DOG (*CYNOMYS LEUCURUS*) BURROWS

Tim W. Clark[1]

White-tailed prairie dogs are able to withstand only a portion of the total range of environmental conditions that prevail annually on the surface of the ground. The burrow environment makes existence possible during periods of unfavorable conditions at the ground surface. The burrow serves for temporary refuge from predators, from excessive summer temperatures or for total withdrawal for several months during the long periods of winter until favorable conditions above ground permit activity there once again.

Some aspects of the burrow systems of black-tailed and Gunnison's prairie dogs have been investigated. However, published information is totally lacking on burrows of the other three species of North American prairie dogs (white-tail, Utah, and Mexican prairie dogs). As part of a study of the ecology and ethology of the white-tailed prairie dog in the Laramie Basin of Wyoming (Clark, 1969) some data was gathered on burrows. This paper presents this information.

Study Area and Methods

Burrows were investigated on eight colonies of white-tailed prairie dogs located on or near Hutton Lake National Wildlife Refuge, Albany County, Wyo. The refuge is situated in southeastern Wyoming, 12 miles southwest of Laramie and 10 miles north of the Wyoming-Colorado border. This area is in the Laramie Plains (elevation 7200 ft) and falls within what Cary (1917) called "Transitional Life-Zone" and Porter (1962) termed "Interior Grassland Plains." This area has been described in detail by Clark (1969). Burrow excavations were carried out on the refuge in the fall of 1966, and observations on other aspects of burrows were made in the summers of 1967 and 1968.

Mapping.—A grid was established on one colony by driving colored stakes (4 ft tall) into the ground at 100 ft intervals. The

[1]Department of Zoology and Physiology, University of Wyoming, Laramie, Wyo. 82070. Present Address: Department of Biology, Wisconsin State University, Medford, Wis. 54451.

resulting grid was characterized by 19 columns, lettered A through S, each column consisting of nine rows, numbered 1 through 9. The grid was 1800 ft long and 800 ft wide.

All of the burrow openings in the grid were marked using numbered metal cattle tags on the end of a 14-inch piece of heavy guage wire. The tags were placed adjacent to each opening; thus each hole had an individual designation. A total of 827 burrows were marked. An estimated 100 burrows were outside of the grid and only about 25 of these were marked and mapped.

The spatial arrangement of the burrow openings within the grid were mapped using grid stakes for orientation. Each opening was characterized with respect to its features (e.g., mound type, diameter of entrance, etc.).

Burrows.—One burrow and part of another were excavated and their structure studied. A one-fourth inch diameter plumber's auger 9 ft long was used to probe ahead of the excavation and prevented loose dirt from falling down into the tunnel. This same piece of equipment served to plug up the tunnel behind temperature and relative humidity measurements.

Microclimatic measurements of the burrow were taken using a hand aspirated psychrometer and a clock-dial-type soil thermometer. A set of microclimatic measurements were taken every 3 ft of tunnel. Each set of measurements consisted of air temperatures, relative humidity values, and soil temperatures.

Organisms other than prairie dogs inhabitating the burrow were sampled by scraping the burrow walls with a small can to remove about 2 inches of soil. The length of each sample was about 3 ft of tunnel. The soil samples were immediately placed in plastic bags and labeled. In the laboratory the soil samples were placed in Berlese funnels for 24 hours. Excelsior was placed in the neck of the funnel to prevent dirt from falling into the collection container. Specimens were preserved in 70% ethyl alcohol.

Results and Discussion

Burrow Mounds.—One of the most obvious indicators of the presence of prairie dogs in an area is the mounds of earth around the burrow entrances. Mounds are formed as a result of the excavation of new burrow systems and the modification of the old ones.

Of the 827 burrows within the grid, 821 conformed to "a mere pile of soil" as described by King (1955) and more specifically followed the description of Tileston and Lechleitner (1966). Only six burrow entrances lacked any type of mound. Those burrow openings without mounds may have resulted from the degeneration of old, unattended mounds or could have been a burrow with little or no excavated soil originally about the entrance. Two of the six burrow entrances lacking a mound seemed to be of the latter type. Since these two entrances were opened by prairie dogs during the course of this study their time of origin was precisely known. The reason for the lack of dirt around the other four entrances was not determined.

Twelve new burrows were constructed in 1966 and 1967. Nine of these were dug outside of the grid in the fall by dispersing individuals, and all burrows had mounds.

Typically the burrow mound of the white-tailed prairie dog is a large, unconsolidated, semirounded structure composed of excavated subsoil. This type of mound contrasts with mounds of *C. gunnisoni gunnisoni*, which are seldom large (Longhurst, 1944), and those of *C. ludovicanus,* which many times are constructed of excavated subsoil combined with soil around the burrow entrance (Merriam, 1901).

Of approximately 2000 burrow mounds examined in eight different colonies, not one "crater-like" (King, 1955) mound was found nor were white-tailed prairie dogs ever observed or evidence found indicating that these animals shaped, packed, or worked the excavated subsoil of burrow mounds as is characteristic of the black-tailed prairie dog (Merriam, 1901; Scheffer, 1947; Wilcomb, 1954; King, 1955; and Smith, 1958).

Burrow maintenance was generally confined to the spring (March and April) and consisted of removal of materials that had been collected in the burrow entrance during the winter. A similar pattern of burrow maintenance has been reported for white-tailed prairie dogs in northern Colorado by Tileston and Lechleitner (1966).

Spatial Arrangement of Burrows.—The density of burrow openings varied from 22 per quadrat (10,000 sq ft) to 0 per quadrat. The mean number of burrow entrances per quadrat was 5.1 (23.9 per acre). The density of burrow openings varied between vegetation types. Only quadrats lying completely within each vegetation type were used to calculate densities. Burrow entrances in the *Bouteloua-Opuntia* Vegetation Type exhibited a density of 23.2 per acre, the *Agropyron-Oryzopsis* Vegetation Type 23.1 per acre, and the *Sarcobatus* Vegetation Type 13.1 per acre.

Tileston and Lechleitner (1966) found a density of 21.9 burrow entrances per acre for white-tailed prairie dogs and 41.9 per acre for black-tailed prairie dogs in northern Colorado. Bailey (1926) estimated the density of holes to be 20 to 40 per acre in many black-tailed prairie dog towns in North Dakota. King (1955) found 22 holes per acre in Wind Cave National Park and at Devil's Tower, Wyo., and Koford (1958) found 100 per acre where animals were fed by tourists.

Burrow Structure.—The structure of burrows was not extensively investigated in this study. One burrow was totally excavated and another one partially excavated.

Excavation of burrow No. 1 was begun on 13 October 1966. This burrow was located in a peripheral position in another colony near colony No. 1 (Figs. 1 and 2). The entrance mound was 5½ ft in

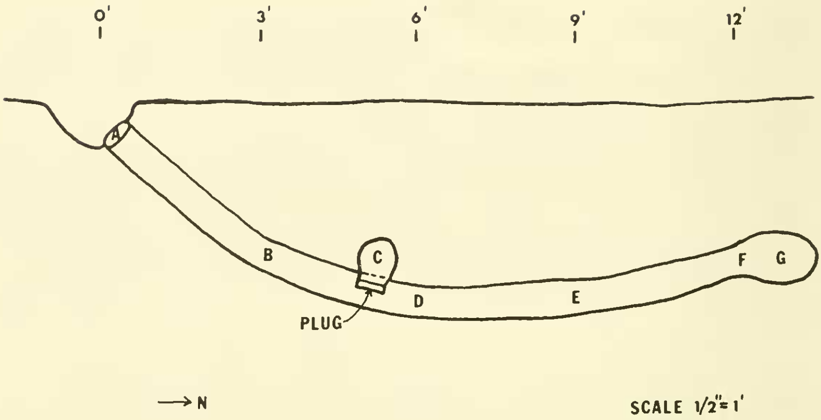

Fig. 1. Schematic diagram showing the side view of white-tailed prairie dog tunnel number one.

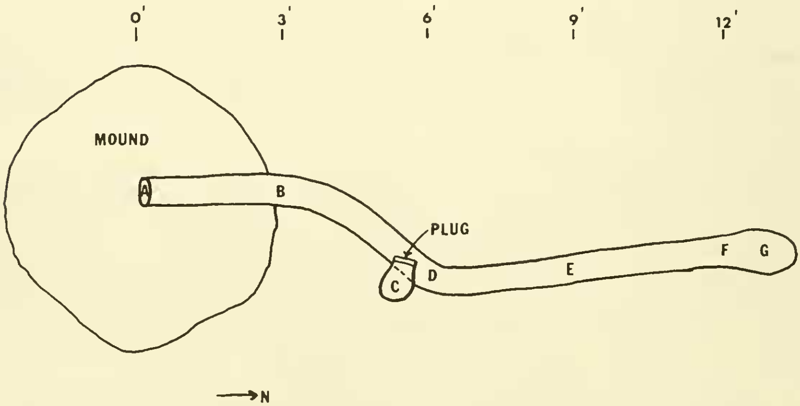

Fig. 2. Schematic diagram showing the top view of white-tailed prairie dog tunnel number one.

diameter and about 6 inches deep. This mound contained three entrances. One entrance was chosen for excavation. The tunnel angled downward at about 40 degrees from the horizontal for the first 7 ft and then it rose about 3 inches per foot to the end. The entrance (station A) was 7 inches in diameter. At station B the tunnel depth was 2 ft, 6 inches, and the diameter of the tunnel was 7 inches. Station C was a blind outpocketing whose entrance had been plugged with dirt. This cavity contained no loose soil or nest materials. It measured 8 inches in diameter and 10 inches in depth. The function of this small outpocketing (C) is unknown. Station D in the tunnel was 3 ft, 8 inches deep, while station E was 3 ft, 6 inches deep and station F was 2 ft, 11 inches deep. The burrow reached its greatest depth at about 7 to 8 ft from the entrance. The entire tunnel was 12 ft long. At the end of the tunnel was a cavity 18 inches across and 11 inches deep. This cavity showed no signs of ever having been used as a nest chamber. The floor of the gallery was covered with loose soil, which did not exceed 2 inches in depth. The loose soil of the first two stations was mixed with prairie dog feces and recently cut plant matter. No fresh soil or signs of fresh digging were found in the tunnel. The diameter was approximately 7 inches throughout the entire length of the tunnel. No nest materials or prairie dogs were found.

The soil profile was 20-36 inches deep with 40% clay present. A hard clay layer was found 18 inches beneath the surface. The parent material is derived from a shale formation. Excavation on burrow No. 2 was begun on 12 November 1966. This burrow was located about 100 yards west of burrow No. 1 (Figs. 3 and 4). A small mound 2 ft in diameter and 6 inches deep was situated on the west side of the entrance. The first 5½ ft of tunnel dropped at approximately a 45 degree angle from the horizontal to a depth of about 6 ft (stations A, B, and C). The diameter of the entrance (station A) was 7 inches, at station B the tunnel was 2½ ft deep and had a diameter of 7 inches. At a point 7½ ft from the entrance (station C) the tunnel diverged. One branch (Branch No. 1) doubled back under the first 7½ ft of tunnel, the other branch (Branch No. 2) continued on in a level plane in the same direction as the first 7½ ft of tunnel. Branch No. 1, for the first 3 ft, remained

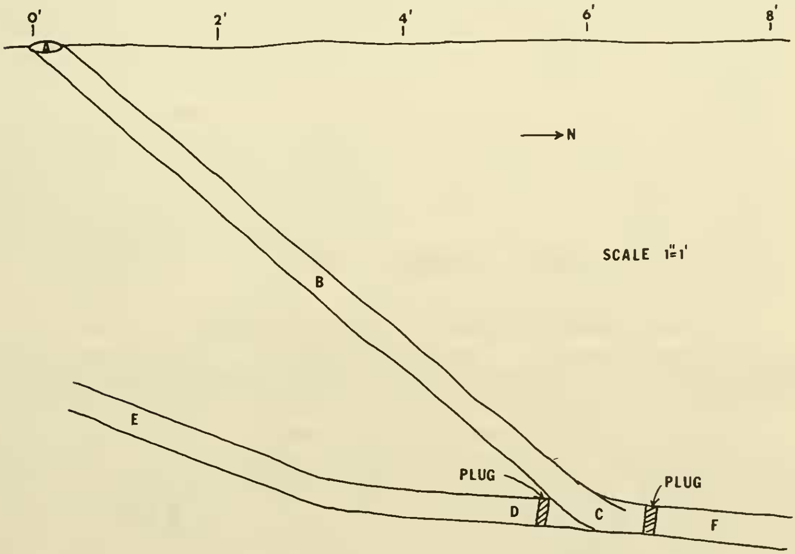

Fig. 3. Schematic diagram showing the side view of white-tailed prairie dog tunnel number two.

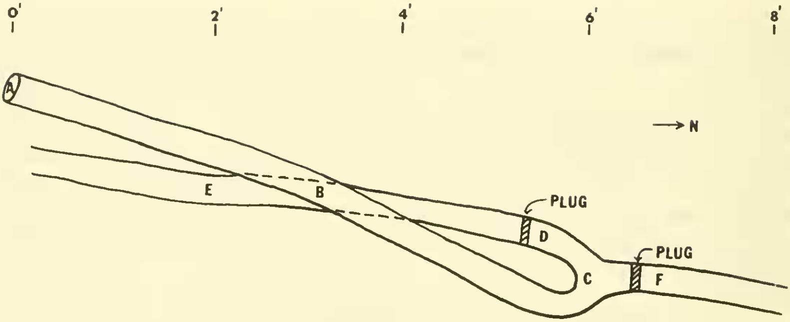

Fig. 4. Schematic diagram showing the top view of white-tailed prairie dog tunnel number two.

at 5½ ft depth and then for the next 2 ft rose to a depth of 4 ft. The entire branch was about 7 inches in diameter throughout its length. Both tunnel branches were plugged with prairie dog feces within 6 inches after the tunnel diverged. The burrow was observed to have been occupied by a prairie dog just prior to the excavation. It was believed that a prairie dog was hibernating in the burrow, since an animal was observed in close association with this burrow up to the time the entire colony had gone into hibernation. Branch No. 2 sloped down over the next 6 ft, dropping over all about 1 ft. The branch had a diameter of 7 inches. About 6 inches beyond the feces plug in this branch a prairie dog femur was found. The floor of the tunnel system was covered by approximately 2 inches of loose dirt. Some plant parts were found near the entrance in the first few feet of the tunnel. At this point, excavation of this burrow was discontinued.

Neither of these burrows was similar to the well-known *C. ludovicanus* burrow excavated by Osgood (Merriam, 1901). Comparing the burrows examined in this study with those of *C. ludovicanus* described by Merriam (1901), Whitehead (1927), Jilson (1871), Thorp (1944), Wilcomb (1954), King (1955), and Smith (1958), and burrows of *C. gunnisoni gunnisoni* investigated by Foster (1955) and Longhurst (1944), there appears to be no species specific pattern of burrow tunnel excavation.

Rongstad (1965) described three types of burrows in the thirteen-lined ground squirrel: nesting, hiding, and hibernating burrows. Observations by McCarley (1966) on *S. tridecemlineatus* and Bradley (1965) on *S. leucurus* agree with Rongstad (1965). This system of burrow classification may be useful in describing prairie dog burrow complexes. Possibly burrow No. 1, excavated in this study, was of the hiding type and burrow No. 2 a hibernating type since it was plugged with feces. The burrows of the white-tailed prairie dog need further investigation.

Burrow Microclimate.—The air temperatures and relative humidity values were investigated in excavated tunnel No. 1. Figure 5

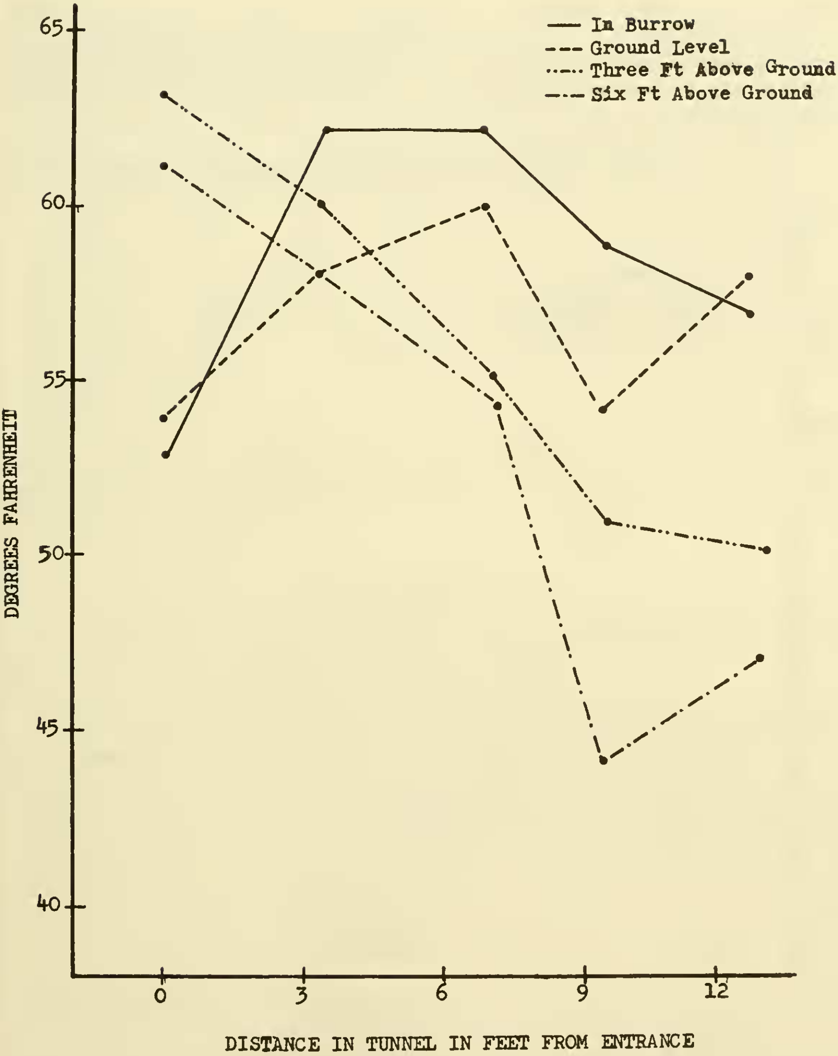

Fig. 5. Air temperatures in degrees F taken at 3 ft intervals within tunnel number one compared with temperatures taken at ground level, 3 ft, and 6 ft above ground surface.

gives the air temperatures in degrees F taken 3 ft ahead of the excavation compared with air temperatures taken at ground level, 3 ft, and 6 ft above the ground surface. The temperature range within the tunnel varied less than the other temperature measurements. The temperature range within the tunnel was 6 F; while at ground level 7 F; 3 ft above ground surface, 14 F; and a 15 F variation at 6 ft above the ground surface. The first 6 ft of tunnel were excavated one day and the last 6 ft in the following two days. The first 6 ft of tunnel had a constant air temperature of 62 F, while the air temperature of the last 6 ft varied 2 degrees. This may be due to the effects of excavating the first 6 ft. Generally the tunnel was warmer than the other temperatures recorded.

Figure 6 presents the relative humidity in percent taken at 3 ft intervals with tunnel No. 1 compared with relative humidity in

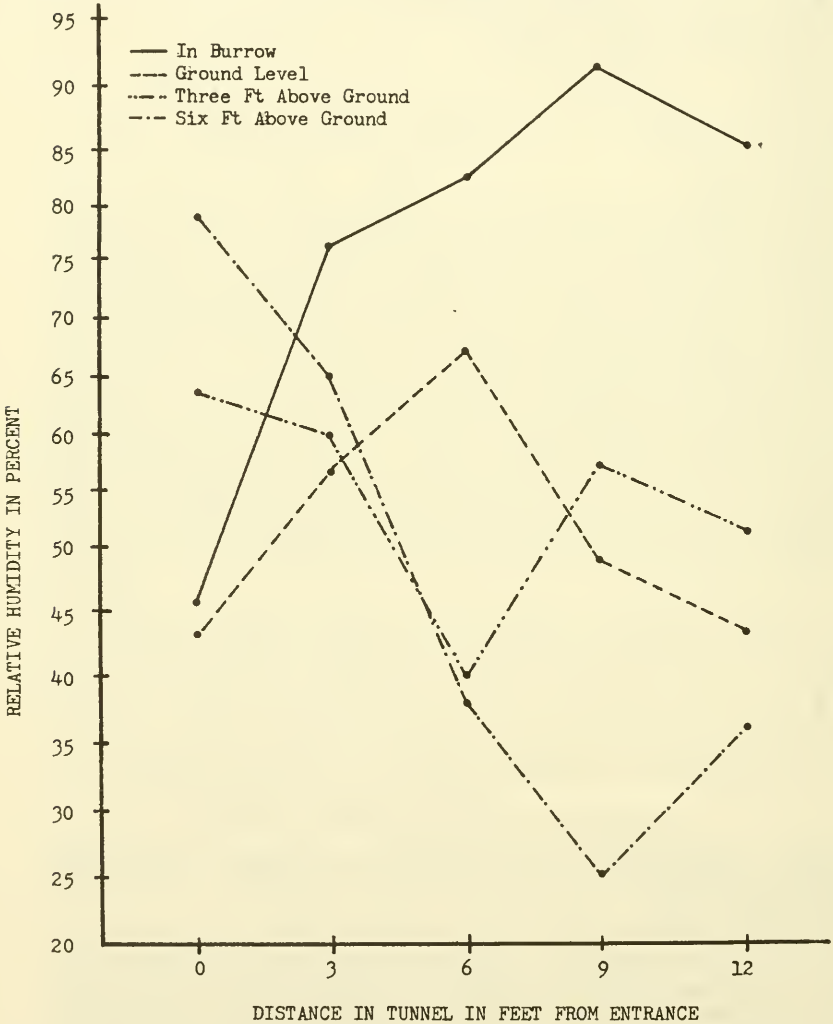

Fig. 6. Relative humidity in per cent taken at 3 ft intervals within tunnel number one compared with relative humidities taken at ground level, 3 ft, and 6 ft above ground surface.

per cent taken at ground level, 3 ft and 6 ft intervals above the ground. The relative humidity in the burrow was higher and more constant than the other humidity measurements. The relative humidity in the tunnel varied 16%; while ground level varied 24%; 3 ft above ground, 24%; and 6 ft above the ground surface, 53%. To what degree the excavational procedures altered the normal air temperatures and relative humidities was not determined.

ORGANISMS IN BURROW.—Only burrow No. 1 was investigated for organisms other than prairie dogs. The tunnel contained a number of Arthropods and a few vertebrates. Table 1 presents the identification and the distribution of the organisms found while excavating burrow No. 1. Sample No. 1 (the first 3 ft of the tunnel) contained no organisms. The tunnel walls of sample No. 2 were very dry and rocklike. The tunnel walls in the other samples were composed of loosely packed, moist dirt.

A total of 23 specimens was found. Sample No. 3 contained the largest number of individuals (N=12), while sample No. 4 contained the greatest taxonomic diversity. The only vertebrates were found in the enlarged terminal segment of the tunnel.

ACKNOWLEDGMENTS

I would like to acknowledge Dr. L. N. Brown whose NSF grant supported the major portion of this study.

TABLE 1. Identification and Distribution of the Organisms by Sample Found in Tunnel Number One.

Sample	Organisms	Numbers
Number 1	————	————
Number 2	Coleoptera	
	Scrabaeidae	
	Coprinae	1 adult
	Tenebrionidae	1 adult
Number 3	Diptera	
	Psychodidae	1 adult and 1 larva
	Sarcophagidae	10 adults
Number 4	Orthoptera	
	Gryllacrididae	
	Rhaphidophorinae	1 adult
	Coleoptera	
	Tenebrionidae	2 adults and 2 larvae
	Scarabaeidae	1 larva
	Tiger Salamander:	
	Ambystoma tigrinum vavortum	1 adult
	Cricket Frog:	
	Pseudacris nigrata triseriata	2 adults

Literature Cited

Bailey, V. 1926. A biological survey of North Dakota. USDA, N. Amer. Fauna 49.

Bradley, W. G., Jr. 1965. Activity patterns and home range of the antelope ground squirrel, *Citellus leucurus*. Ph.D. Thesis, Univ. Arizona, Tucson. 136 p.

Cary, M. 1917. Life-zones investigations in Wyoming. N. Amer. Fauna No. 42.

Clark, T. W. 1969. A study of the ecology and ethology of the white-tailed prairie dog (*Cynomys leucurus*) in the Laramie Basin, Wyoming. Unpubl. 128 p.

Jilson, B. C. 1871. Habits of prairie dogs. Amer. Nat. 5:24-29.

King, J. A. 1955. Social behavior, social organization, and population dynamics in a black-tailed prairie dog town in the Black Hills of South Dakota. Univ. Mich. Contrib. Lab. Vert. Biol. 67:1-123.

Koford, C. B. 1958. Prairie dogs, whitefaces and blue grama. Wildl. Monogr. No. 3.

Longhurst, W. 1944. Observations on the ecology of the Gunnison prairie dog in Colorado. J. Mammal. 25:24-36.

McCarley, H. 1966. Annual cycle, population dynamics and adaptive behavior of *Citellus tridecemlineatus*. J. Mammal. 47:294-316.

Merriam, C. H. 1901. The prairie dog of the Great Plains. *In* USDA Yearbook 1901. p. 257-270.

Porter, C. L. 1962. Vegetational zones in Wyoming. Univ. Wyom. Publ. 27:6-12.

Rongstad, O. J. 1965. A life-history study of thirteen-lined ground squirrels in southern Wisconsin. J. Mammal. 46:76-87.

Scheffer, T. H. 1947. Ecological comparisons of the plains prairie dog and the zuni species. J. Mammal. 49:401-406.

Smith, R. E. 1958. Natural history of the prairie dog in Kansas. Univ. Kans. Mus. Nat. Hist. and State Biol. Surv. Misc. Publ. 16:1-36.

Thorp, J. 1944. Effects of certain animals that live in soils. Sci. Mon. 68: 180-191.

Tileston, J. V., and R. R. Lechleitner. 1966. Some comparisons of the black-tailed and white-tailed prairie dogs in north-central Colorado. Amer. Midl. Nat. 75:292-316.

Whitehead, L. C. 1927. Notes on prairie dogs. J. Mammal. 8:58.

Wilcomb, M. J. 1954. A study of prairie dog burrow systems and the ecology of their arthropod inhabitants in central Oklahoma. Ph.D. Thesis, Univ. Oklahoma, Norman.